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102-08147-BJR/MMD
September 10, 2020

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS) Unit 2**
Docket No. STN 50-529 / License No. NPF 51
Licensee Event Report 2020-001-01

Enclosed please find Licensee Event Report (LER) 50-529/2020-001-01 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER supplement provides the cause and corrective actions for a previously reported Unit 2 reactor trip and other specified system actuations that occurred on March 3, 2020.

In accordance with 10 CFR 50.4, copies of this LER are being forwarded to the Nuclear Regulatory Commission (NRC) Regional Office, NRC Region IV, and the Senior Resident Inspector.

Arizona Public Service Company makes no commitments in this letter. If you have questions regarding this submittal, please contact Matthew Kura, Department Leader, Nuclear Regulatory Affairs, at (623) 393-5379.

Sincerely,

BJR/MMD

Enclosure

cc:	S. A. Morris	NRC Region IV Regional Administrator
	S. P. Lingam	NRC NRR Project Manager for PVNGS
	C. A. Peabody	NRC Senior Resident Inspector PVNGS

**LICENSEE EVENT REPORT (LER)**

(See Page 3 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form <https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Library, and Information Collections Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollect.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk at: omb_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. Facility Name Palo Verde Nuclear Generating Station (PVNGS) Unit 2	2. Docket Number 05000529	3. Page 1 OF 4
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4. Title
Unit 2 Reactor Trip on Low Steam Generator Level Signal

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
03	03	2020	2020	- 001	- 01	9	10	2020	Facility Name	Docket Number
										05000
										05000

9. Operating Mode

1

10. Power Level

100

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

10 CFR Part 20	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(2)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	10 CFR Part 73
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	10 CFR Part 21	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)(i)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	10 CFR Part 50	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	

☐ Other (Specify here, in Abstract, or in NRC 366A).**12. Licensee Contact for this LER**

Licensee Contact

Matthew Kura, Department Leader, Nuclear Regulatory Affairs

Phone Number (Include Area Code)

623-393-5379

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable To IRIS	Cause	System	Component	Manufacturer	Reportable To IRIS
X	SJ	P	B580	Y					

14. Supplemental Report Expected☒ No ☐ Yes (If yes, complete 15. Expected Submission Date)**15. Expected Submission Date**

Month Day Year

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

This Licensee Event Report addresses an event on March 3, 2020, when the Unit 2 Reactor automatically tripped on a low Steam Generator (SG) 1 level signal.

The low SG level occurred because of a trip of both of the Main Feedwater Pumps (MFWPs), which tripped during restoration of power to the MFWPs Lube Oil (LO) control panels. A Reactor Power Cutback (RPC) signal was initiated upon loss of the MFWPs, followed by the reactor trip on low SG level. Auxiliary Feedwater Actuation Signals (AFAS) were then received and the Auxiliary Feedwater pumps, the Essential Spray Pond (ESP) pumps and the Emergency Diesel Generators (DGs) actuated as a result. This event is reportable under 10CFR 50.73(a)(2)(iv)(A) due to the Reactor Protection System (RPS), AFAS, and ESP/DGs actuations per NUREG 1022 Revision 3.

The cause of the event was attributed to a lack of guidance in the operating procedures related to the impact of de-energization and re-energization of the MFWP A and B LO control panels. The cause was also attributed to the lack of a redundant power source to prevent both MFWPs from tripping simultaneously which led to the Unit trip.

The corrective actions include procedure revisions as well as a design modification.

No previous similar events have been reported to the NRC by PVNGS in the prior three years.



LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

(See NUREG-1022, R.3 for instruction and guidance for completing this form
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1. FACILITY NAME		2. DOCKET NUMBER		3. LER NUMBER		
Palo Verde Nuclear Generating Station (PVNGS) Unit 2		05000-529		YEAR	SEQUENTIAL NUMBER	REV NO.
				2020	- 001	- 01

NARRATIVE

All times are Mountain Standard Time and approximate unless otherwise indicated.

1. REPORTING REQUIREMENT(S):

This Licensee Event Report (LER) is being submitted pursuant to 10CFR 50.73(a)(2)(iv)(A) as an actuation of the Reactor Protection System (RPS), which resulted in an Auxiliary Feedwater System actuation, which led to the start of the Auxiliary Feedwater pumps, Essential Spray Pond pumps and both Emergency Diesel Generators.

The event was reported to the NRC via ENS #54560 per 10CFR 50.72(b)(2)(iv)(B) RPS Actuation (scram) and 50.72(b)(3)(iv)(A) Specified System Actuation.

2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):

Steam Generator (SG) (EIS Code: AB): During normal operation, reactor coolant leaving the core of the reactor vessel enters two "hot legs", one per loop, and flows to the steam generators. The hot reactor coolant enters the steam generator through the inlet nozzle in the steam generator primary head. The steam generator is a shell and U-tube heat exchanger with an integral economizer. It operates with reactor coolant on the tube side and secondary feedwater on the shell side. Primary (reactor) coolant flows through the U-tubes giving up its heat to the secondary feedwater in the shell side of the steam generator.

The heat added by the reactor coolant causes the feedwater (secondary coolant) to boil thus generating steam for turbine operation. The primary (reactor coolant) and secondary (feedwater and steam) systems are separated and do not come in contact with each other. This design prevents radioactive contamination of the secondary system. Reactor coolant leaves the steam generator through two outlet nozzles. A vertical divider plate separates the inlet and outlet plenums of the primary head. Each outlet supplies the suction leg piping of the reactor coolant pumps.

Reactor Protection System (RPS) (EIS Code: JC): The system consists of sensors, calculators, logic, and other equipment necessary to monitor selected parameters to effect reliable and rapid reactor shutdown (reactor trip). The system's functions are to protect the core Specified Acceptable Fuel Design Limits and Reactor Coolant System (RCS) (EIS Code: AB) pressure boundary for incidents of moderate frequency, and to provide assistance in limiting conditions for certain infrequent events and limiting faults. Among other automatic trips, the RPS trips the reactor upon receipt of a low steam generator water level signal (44.2 percent wide range water level).

Main feedwater (MFW) (EIS Code: SJ): The system consists of piping, main feedwater pumps (MFWPs) (EIS Code: JK), high pressure heaters, valves, controls, instrumentation, and associated equipment which supply feedwater to the SG. Each MFWP is a turbine-driven pump capable of supplying 65 percent of main feedwater system capacity. There are two MFWPs which serve both SGs.

The MFWPs are each provided with a Lube Oil (LO) (EIS Code: SJ) control panel. The function of the LO control panel protective relays is to monitor MFWP and turbine bearings LO and control oil pressure, and to take protective actions when a low-pressure condition is detected. Those protective actions include the trip of the affected MFWP. A loss of feed pump initiates a Reactor Power Cutback (RPC), which drops pre-selected Control Element Assemblies (CEAs) (EIS Code: AA) and reduces main turbine load to rapidly reduce reactor power. This allows the plant to remain on-line during these events and significantly reduces the requirements for steam bypass valve and MFWP capacity.

Engineered Safety Features Actuation Systems (ESFAS) (EIS Code: JE): The system provides initiating signals to components requiring automatic actuation. These actuating signals are generated when monitored variables reach levels that require protective action. The system performs its function by initiating ESFAS equipment if selected



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abnormal conditions are detected. The setpoints for the actuation signals are selected to minimize the consequences of design basis accidents, which include the fuel handling accident, fire/smoke, and loss of power.

Auxiliary Feedwater Actuation Signal (AFAS) (EIS Code: BA). During normal power generation, the two essential pumps are placed in a standby condition. The system is provided with two channels of AFAS (AFAS-1 or -2) corresponding to each SG. An AFAS will automatically start and align the essential pumps to feed the affected SG upon receipt of a low steam generator water level signal (25.8 percent wide range water level). As long as the affected SG is intact, as evidenced by the existing SG differential pressure (relative to the other SG), the auxiliary feed system will automatically maintain SG level within a prescribed band of 25.8 percent wide range to 40.8 percent wide range indication.

Essential Spray Pond (ESP) (EIS Code: BS): The system consists of two independent, redundant safety related flow trains. Each train takes suction from, and returns water to, its associated spray pond. One flow train supplies the cooling water required for plant shutdown to Train A Essential Cooling Water (EW) (EIS Code: BI) heat exchanger and Train A DG cooling water heat exchangers (EIS Code: LB). The other flow train supplies cooling water to the same items in Train B. Heat is rejected to the ESP system, which provides the unit with its Ultimate Heat Sink. The spray pond pumps start automatically in response to engineered ESFAS signals such as an AFAS. Either flow train can supply sufficient cooling water to allow a safe plant shutdown independent of the other flow train for analyzed accidents. The ESP system is normally in standby during normal power generation and is operated manually to recirculate the system to maintain its chemistry. It is also operated during plant shutdowns or when the emergency DG are in service.

Diesel Generator (DG) (EIS Code: EK): The system is a Class 1E standby generation system that functions as a standby source of alternating current (AC) power for safe plant shutdown in the event of loss of preferred (off-site) power. This system includes all necessary auxiliaries to maintain the diesel engine in a readiness condition. Each DG is an independent unit capable of providing power to safety equipment in the event of the loss of the preferred (off-site) power to safely shutdown the plant or mitigate the consequences of a loss of coolant accident (LOCA).

3. INITIAL PLANT CONDITIONS:

On March 3, 2020, PVNGS Unit 2 was in Mode 1 (Power Operation) at 100 percent power at normal operating temperature and normal operating pressure. There were no inoperable structures, systems, or components at the time that contributed to this event.

4. EVENT DESCRIPTION:

On March 3, 2020 during dayshift, an auxiliary operator removing a crane from service inadvertently opened the wrong breaker. This de-energized the panel that supplies power to both MFWP A and B LO control panels; and resulted in the auto-start of the emergency bearing oil pumps for both MFWP.

During the restoration of power to the LO control panels at 20:49, the trip system entered a 10-second diagnostic and energized the digital trip relay inside the panels. By design, the digital relays default to the tripped condition upon loss of power, whereas the auxiliary relays default to the non-tripped state. Because the auxiliary relay does not have an initialization delay, it immediately actuated in response to the digital relay being tripped. This sent a loss of LO pressure signal to trip the MFWPs, and initiated the loss of feed pump RPC. Within 27 seconds, at 20:50, an automatic reactor trip occurred due to low SG #1 water level followed closely by low SG #2 water level trip. The lowering SG levels resulted in AFAS-1 and AFAS-2 actuations within 35 seconds of the reactor trip. This resulted in a start of the Auxiliary Feedwater pumps, ESP pumps and the DGs. Once the 10-second diagnostic timed out and the trip relay contact opened, clearing the LO low pressure signal, the MFWPs were available to be reset and restarted at that point.

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CONTINUATION SHEET**

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5. ASSESSMENT OF SAFETY CONSEQUENCES:

This event did not result in a challenge to fission product barriers or result in the release of radioactive materials. The event did not adversely affect the safe operation of the plant or health and safety of the public.

The RPS functioned as designed and initiated an automatic reactor trip that placed the plant in a safe condition. All required plant systems responded as expected and all CEAs fully inserted into the reactor core. The AFAS, the ESP pumps and the DGs actuated due to the of the low SG level. No safety related components failed to actuate. In addition, the MFWPs were available immediately following their trip to provide the heat removal function, if required.

The Unit 2 reactor trip did not result in a transient more severe than those already analyzed in the Updated Final Safety Analysis Report. The primary system and secondary pressure boundary limits were not approached.

The event would not have prevented the fulfillment of any safety function of structures or systems as defined by 10CFR 50.73(a)(2)(v).

6. CAUSE OF THE EVENT:

The cause of the event was attributed to a lack of guidance in the operating procedures related to the impact of de-energization and re-energization of the MFWP A and B LO control panels. The cause was also attributed to the lack of a redundant power source to prevent both MFWPs from tripping simultaneously which led to the Unit trip.

7. CORRECTIVE ACTIONS:

The relevant system operating, alarm response, and abnormal operating procedures were revised to provide corresponding direction to address a loss and restoration of power to the MFWP A and B LO control panels. A design modification to provide a redundant power source was also initiated.

8. PREVIOUS SIMILAR EVENTS:

No previous similar events have been reported to the NRC by PVNGS in the prior three years.